CLAIMS

What is Claimed is:

1. A circularly polarized antenna system, comprising:

a circularly-polarized antenna;

a high-impedance buffer surface, surrounding the circularly polarized antenna, and disposed between the circularly polarized antenna and a ground plane; and

wherein a width of the high-impedance buffer surface between the circularly-polarized antenna and the ground plane is selected to achieve an H-plane radiation pattern substantially identical to an E-plane radiation pattern over a desired scan angle.

2. The antenna system of claim 1, wherein the ground plane is a metallic ground plane.

3. The antenna system of claim 1, wherein the width x of the high-impedance buffer surface is in the order of several wavelengths of the energy emitted by the circularly polarized antenna.

4. The antenna system of claim 1, wherein the high impedance buffer surface comprises a substrate having plurality of capacitive elements.

5. The antenna system of claim 4, wherein the capacitive elements are edge coupled.

6. The antenna system of claim 5, wherein the capacitive elements are coupled to a conductive via electrically connecting the capacitive element to the metallic ground plane.

7. The antenna system of claim 1, wherein the high impedance buffer comprises a substrate having:

a sheet capacitance defined according to $C = \frac{w(\varepsilon_1 + \varepsilon_2)}{\pi} \cosh^{-1}\left(\frac{a}{g}\right)$;

a sheet inductance according to $L = \mu t$;

a resonance frequency according to $\omega = \frac{1}{\sqrt{LC}}$;

and a bandwidth according to $\frac{\Delta\omega}{\omega_0} = \frac{\sqrt{\frac{L}{C}}}{\sqrt{\frac{\mu_0}{\varepsilon_0}}}$; and

wherein *a* is a lattice constant, *g* is a width of a gap between capacitive elements on the substrate, *w* is a width of each of the capacitive elements, *t* is a thickness of the substrate, ε_0 is the free-space permittivity constant, ε_1 and ε_2 are permittivity constants of the substrate, μ_0 is the free-space permeability constant, μ is the permeability constant of the substrate, Δw is the bandwidth around a center frequency ω_0.

8. The antenna system of claim 5, wherein the bandwidth is the Ku band, and the lattice constant *a* is approximately 0.145 inches, the gap width *g* is approximately 0.02 inches, and the substrate thickness *t* is approximately 0.62 mil.

9. The antenna system of clam 1, wherein:

the circularly polarized antenna comprises a phased array having a plurality of array elements; and

each of the array elements are separated by the high-impedance buffer.

10. The antenna system of claim 2, wherein the width of the high-impedance buffer surface separating the elements is approximately 1/8 wavelength of the energy emitted by the circularly polarized antenna.

11. A circularly polarized antenna system, comprising:

a circularly-polarized antenna;

means for electrically isolating the circularly polarized antenna from a ground plane;

wherein a width of the means for electrically isolating the circularly polarized antenna from the ground plane is selected to achieve an H-plane radiation pattern substantially identical to an E-plane radiation pattern over a desired scan angle.

12. The antenna system of claim 11, wherein the ground plane is a metallic ground plane.

13. The antenna system of claim 11, wherein the width of the means for electrically isolating the circularly polarized antenna from the ground plane is in the order of several wavelengths of the energy emitted by the circularly polarized antenna.

14. The antenna system of claim 11, wherein the means for electrically isolating the circularly polarized antenna from a ground plane comprises a plurality of capacitive elements.

15. The antenna system of claim 14, wherein the capacitive elements are edge coupled.

16. The antenna system of claim 15, wherein the capacitive elements are coupled to a means for electrically connecting the capacitive element to the metallic ground plane.

17. The antenna system of claim 11, wherein the means for electrically isolating the circularly polarized antenna from a ground plane comprises a high impedance surface on a substrate having:

a sheet capacitance defined according to $C = \frac{w(\varepsilon_1 + \varepsilon_2)}{\pi}\cosh^{-1}\left(\frac{a}{g}\right)$;

a sheet inductance according to $L = \mu t$;

a resonance frequency according to $\omega = \frac{1}{\sqrt{LC}}$;

and a bandwidth according to $\frac{\Delta\omega}{\omega_0} = \frac{\sqrt{\frac{L}{C}}}{\sqrt{\frac{\mu_0}{\varepsilon_0}}}$; and

wherein a is a lattice constant, g is a width of a gap between capacitive elements on the substrate, w is a width of each of the capacitive elements, t is a thickness of the substrate, ε_0 is the free-space permittivity constant, ε_1 and ε_2 are permittivity constants of the substrate, μ_0 is the free-space permeability constant, μ is the permeability constant of the substrate, Δw is the bandwidth around a center frequency ω_0.

18. The antenna system of claim 17, wherein the bandwidth is the Ku band, and the lattice constant a is approximately 0.145 inches, the gap width g is approximately 0.02 inches, and the substrate thickness t is approximately 0.62 mil.

19. The antenna system of clam 11, wherein:

the circularly polarized antenna comprises a phased array having a plurality of array elements; and

each of the array elements are separated by the high-impedance buffer.

20. The antenna system of claim 19, wherein a width of the high-impedance buffer surface separating the elements is approximately 1/8 wavelength of the energy emitted by the circularly polarized antenna.